SOUTHERN CALIFORNIA
EDISON®
An EDISON INTERNATIONAL® Company

A. Edward Scherer
Manager of
Nuclear Regulatory Affairs

June 3, 2004

Document Control Desk
U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C., 20555-0001

Subject: **Docket No. 50-361**
60-day Post Refueling Outage Reactor Pressure Vessel Head Inspection Report for San Onofre Nuclear Generating Station, Unit 2

References: First Revised NRC Order EA-03-009, "Issuance of First Revised NRC Order (EA-03-009) Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads At Pressurized Water Reactors"

Dear Sir or Madam:

This letter provides the Southern California Edison Company (SCE) 60-day post refueling outage response to First Revised NRC Order EA-03-009, "Issuance of First Revised NRC Order (EA-03-009) Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads At Pressurized Water Reactors" for San Onofre Nuclear Generating Station, Unit 2.

As required by First Revised NRC Order EA-03-009, SCE completed inspections of the reactor pressure vessel head (RPVH) penetrations during the Unit 2 Cycle 13 refueling outage which ended on April 6, 2004.

In summary, SCE performed a bare metal visual inspection of all 102 RPVH penetrations, a volumetric examination (and supplemental inside diameter surface examination) of all 91 control element drive mechanism (CEDM) nozzles, a wetted surface examination of the vent line penetration, and a combination of volumetric and wetted surface examinations of all ten In-Core Instrument (ICI) nozzles. Visual inspections were also performed to identify potential boric acid leaks from pressure-retaining components above the RPV head. In addition to the requirements of the First Revised Order, supplementary surface examinations were performed on the J-groove attachment welds of seven CEDM nozzles.

P.O. Box 128
San Clemente, CA 92674-0128
949-368-7501
Fax 949-368-7575

A101

No primary water stress corrosion cracking was identified in any reactor vessel head penetration or attachment weld, no through-wall leakage was identified at any reactor vessel head penetration, and no indication of reactor vessel head degradation was identified during the performance of these inspections at SONGS Unit 2. Shallow linear and rounded indications were identified on the surface of three ICI penetration attachment welds. It was concluded that these shallow indications were not indicative of PWSCC after SCE performed light grinding operations to confirm that they were not connected to subsurface branching cracks. The SONGS Unit 2 reactor head required no additional corrective actions nor root cause evaluations. Enclosure 1 provides additional details of the specific inspection activities.

If you have any questions or would like additional information concerning this subject, please call Mr. Jack Rainsberry (949) 368-7420.

Sincerely,

Enclosures

cc: B. S. Mallett, Regional Administrator, NRC Region IV
B. M. Pham, NRC Project Manager, San Onofre Units 2 and 3
C. C. Osterholtz, NRC Senior Resident Inspector, San Onofre Units 2 and 3

Enclosure 1

60-day Post Refueling Outage
Reactor Pressure Vessel Head Inspection Report for
San Onofre Nuclear Generating Station, Unit 2

References:

1. First Revised NRC Order EA-03-009, "Issuance of First Revised NRC Order (EA-03-009) Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads At Pressurized Water Reactors"

2. Letter from A. E. Scherer (SCE) to the Document Control Desk (NRC) dated February 28, 2004, Subject: Docket Nos. 50-361 and 50-362 Response to First Revised NRC Order (EA-03-009) Issued February 20, 2004 and Additional Information Regarding Relaxation Requests 1 and 2 for Reactor Pressure Vessel Head Penetration Inspection Requirements for San Onofre Nuclear Generating Station (SONGS) Units 2 and 3 (TAC Nos. MC1540, MC1541, MC1542, and MC1543)

The following activities were completed for the San Onofre Nuclear Generating Station (SONGS) Unit 2 reactor head during the Cycle 13 refueling outage:

In accordance with part IV.A, SCE calculated the susceptibility category of the SONGS Unit 2 RPVH to PWSCC related degradation, as represented by a value of effective degradation years (EDY) for the end of each operating cycle, using the specified equation. As of the end of the Cycle 12 fuel cycle the calculated value for SONGS Unit 2 was 16.3 EDY.

In accordance with part IV.B, SCE assigned SONGS Unit 2 to the High PWSCC susceptibility category.

In accordance with part IV.C(1), SCE performed Reactor Pressure Vessel (RPV) head and head penetration nozzle inspections using the techniques of paragraph IV.C.(5)(a) and paragraph IV.C.(5)(b).

In accordance with paragraph IV.C.(5)(a), a bare metal visual examination of no less than 95 percent of the RPV head surface (including 360° around each RPV head penetration nozzle) was performed. Faint traces of boric acid were found on the RPV head surface which appeared as a light surface film. This was attributed to residual spillage from the CEDM housing venting operations above the head. Very minor amounts of surface corrosion were present in some locations with no measurable depth.

SCE confirmed that the surface obscured by support structure interferences which are located at RPV head elevations downslope from the outermost RPV head penetration constitute less than 5 percent of the RPV head surface. SCE inspected those areas of the RPV head upslope and downslope from the support structure interferences. The SONGS reactor heads have lift rig structural attachment points at 15 locations evenly spaced around the perimeter. Each of these support locations have a vertical and a horizontal surface that is obscured from visual inspection. Each obscured surface has dimensions of approximately five inches by six inches. There was no evidence of boron or degradation of the reactor head material in these areas.

In accordance with paragraph IV.C.(5)(b), non-visual NDE was performed on each of the 102 penetrations.

The vent line was examined in accordance with method (ii), an ET examination of the entire wetted surface of the J-groove weld and the vent line penetration. The inspection probes for both the weld surface and the vent line penetration surfaces were delivered manually. No indications of PWSCC were identified as a result of this inspection.

All 91 CEDM penetrations were examined in accordance with method (i), UT examinations of the penetration nozzle volume from at least 2 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to as far down the nozzle as possible. The effective inspection coverages above and below the weld for each nozzle are provided in Attachment 1. There were no exceptions to the minimum inspection distances approved for SONGS Unit 2 in Relaxation Request #2 (Reference 2). In addition, supplemental ET surface examinations of the inside diameters of all 91 CEDM penetrations were performed and supplemental ET surface examinations of seven CEDM J-groove attachment welds were performed. No indications of PWSCC were identified as a result of this inspection.

All ten ICI penetrations were examined in accordance with method (iii), a combination of methods (i) and (ii). Attachment 2 provides detailed coverage information obtained using each inspection technique in both tabular and graphical format. The inspection techniques used included: remote UT and ET from the ID surface, remote J-weld ET examinations on the wetted surface, manually delivered ET examinations on the ICI bottom face, manually delivered ET examination of the OD surface below the weld, and manually delivered PT on the J-groove weld and adjacent penetration surfaces. PT was performed on four penetrations (ICI nozzles 93, 97, 98, and 101) where complete examination coverage using UT and ET was not obtained.

Penetrations 93, 97, and 98 had PT indications and penetration 101 had no indications. ICI penetration 93 had three rounded indications on the attachment weld surface that were acceptable per ASME Section XI code acceptance criteria. To ensure that these indications were not connected to subsurface PWSCC, SCE removed approximately 0.040" of material from the weld surface. Final PT revealed that one indication was completely removed and the other two indications remained small, rounded, and code

acceptable. ICI penetration 97 had two rejectable rounded indications at the interface between the penetration outside diameter and the attachment weld. The PT bleedout was approximately 0.500" in diameter for one indication and approximately 0.125" in diameter for the other indication. One indication was completely removed by grinding 0.125" of material from the surface and the other indication was completely removed by grinding 0.25" of material from the surface. ICI penetration 98 had two linear indications, one on bottom of the penetration and the other on the attachment weld. The indication on the surface of the attachment weld was approximately 0.500" in length. The indication on the bottom of the penetration consisted of a set of seven short linear indications on the edge of the penetration tube. All seven indications crossed through the outside corner of the penetration and were approximately 0.125" in length. All eight of these indications were completely removed by grinding 0.125" of material from the surface. Final PT examination results for ICI penetrations 93, 97, and 98 were acceptable.

In accordance with part IV.D, visual inspections were performed to identify potential boric acid leaks from pressure-retaining components above the RPV head. As discussed above, light traces of boric acid were attributed to CEDM housing venting operations. These light traces of boric acid were removed from the head using soft cloths wetted with deionized water.

In accordance with part IV.E, SCE submits this report within 60 days after returning the plant to operation.

In conclusion, SCE found no evidence of Reactor Vessel Head degradation or boric acid leakage from the reactor coolant pressure boundary during these inspection activities.

Attachment 1

Measured Coverage Above and Below CEDM Welds

	Inspection Coverage	
Penetration #	Above Weld	Below Weld
Pen 01	4.44	1.21
Pen 02	4.40	1.45
Pen 03	3.88	0.97
Pen 04	2.40	1.29
Pen 05	4.60	1.29
Pen 06	3.76	1.05
Pen 07	3.68	1.05
Pen 08	4.16	1.21
Pen 09	3.72	1.29
Pen 10	3.84	1.17
Pen 11	3.16	1.13
Pen 12	4.08	1.41
Pen 13	4.16	1.41
Pen 14	3.44	1.45
Pen 15	3.64	1.53
Pen 16	3.52	1.33
Pen 17	3.52	1.01
Pen 18	3.60	1.29
Pen 19	3.96	1.09
Pen 20	3.60	1.17
Pen 21	3.88	1.17
Pen 22	4.04	1.01
Pen 23	3.44	1.13
Pen 24	3.84	1.21
Pen 25	3.44	1.21
Pen 26	3.56	1.05
Pen 27	3.68	0.93
Pen 28	3.80	1.29
Pen 29	4.12	1.29
Pen 30	3.56	1.41
Pen 31	3.60	1.25
Pen 32	3.52	1.25
Pen 33	3.68	1.09
Pen 34	3.68	1.21
Pen 35	3.84	1.09
Pen 36	3.76	1.05
Pen 37	4.16	1.09
Pen 38	3.56	1.17
Pen 39	3.72	0.97
Pen 40	3.48	0.97
Pen 41	3.32	0.93
Pen 42	3.32	1.13
Pen 43	3.44	0.85
Pen 44	3.76	1.17
Pen 45	3.60	1.09

	Inspection Coverage	
Penetration #	Above Weld	Below Weld
Pen 46	3.64	0.97
Pen 47	2.84	0.93
Pen 48	3.68	1.05
Pen 49	4.24	1.09
Pen 50	3.20	0.97
Pen 51	2.92	1.09
Pen 52	3.28	1.13
Pen 53	3.52	0.89
Pen 54	3.28	0.81
Pen 55	2.76	0.77
Pen 56	3.72	0.85
Pen 57	3.76	0.97
Pen 58	3.40	0.69
Pen 59	3.04	0.97
Pen 60	3.96	0.93
Pen 61	3.92	1.13
Pen 62	3.28	1.05
Pen 63	3.20	0.69
Pen 64	3.60	0.93
Pen 65	3.20	0.93
Pen 66	3.32	0.77
Pen 67	2.64	0.61
Pen 68	4.20	1.09
Pen 69	3.92	0.93
Pen 70	3.48	0.97
Pen 71	3.80	0.97
Pen 72	3.60	0.73
Pen 73	3.24	0.65
Pen 74	3.20	0.77
Pen 75	2.92	0.65
Pen 76	2.92	0.85
Pen 77	3.28	0.77
Pen 78	3.32	0.69
Pen 79	2.44	0.77
Pen 80	3.60	1.05
Pen 81	3.84	0.89
Pen 82	3.92	0.65
Pen 83	3.48	0.65
Pen 84	3.28	0.57
Pen 85	3.12	0.57
Pen 86	2.92	0.93
Pen 87	2.92	0.93
Pen 88	4.24	0.81
Pen 89	2.96	0.77
Pen 90	2.72	0.65
Pen 91	2.56	0.85

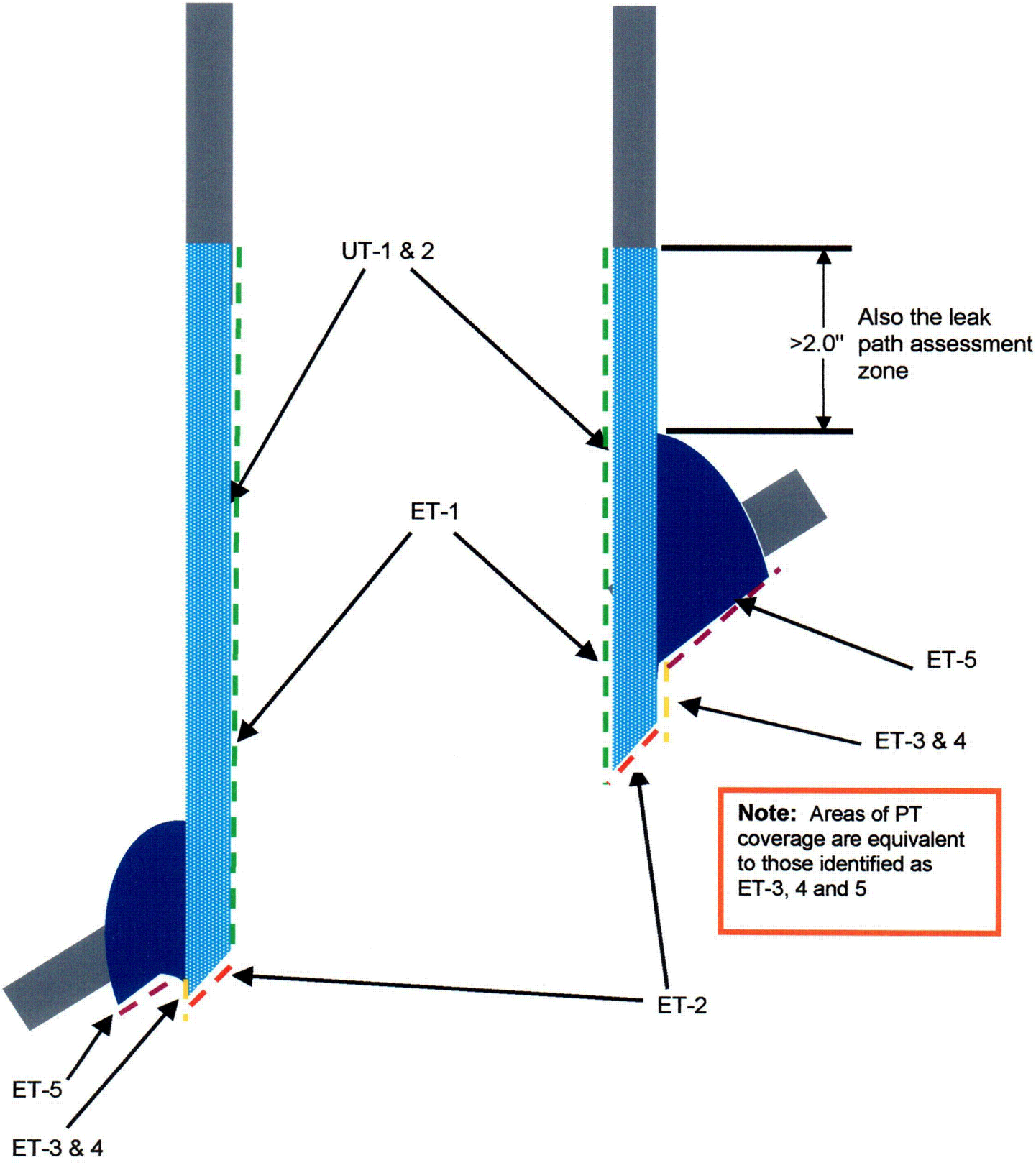
Attachment 2

Summary of ICI Examinations

ICI	ECT ID Surface ET-1	ECT Bottom Face ET-2	ECT OD Surface Below Weld ET-3 and 4	TOFD-UT to Bottom of Weld UT-1	Supplementary UT to Weld Bottom UT-2	J-Groove Weld ECT ET-5	Liquid Penetrant Test PT	Leak Path Assessment UT
92	0 360	0 360	0 360	157 138	80 190	---- ----	---- ----	0 360
93	0 360	0 360	0 360	44 120 161 328	---- ----	156 172	270 180	0 360
94	0 360	0 360	0 360	158 118	---- ----	107 170	---- ----	0 360
95	0 360	0 360	0 360	152 112	91 190	---- ----	---- ----	0 360
96	0 360	0 360	0 360	344 102 166 305	---- ----	84 277 300 351	---- ----	0 360
97	0 360	0 360	0 360	38 112 172 336	80 190	---- ----	270 90	0 360
98	0 360	0 360	0 360	160 119	---- ----	68 293	270 90	0 360
99	0 360	0 360	0 360	62 112 180 234 258 328	---- ----	84 74	---- ----	0 360
100	0 360	0 360	0 360	40 66 180 334	---- ----	58 48	---- ----	0 360
101	0 360	0 360	0 360	61 114 174 313	---- ----	104 185 300 345	270 90	0 360

C01

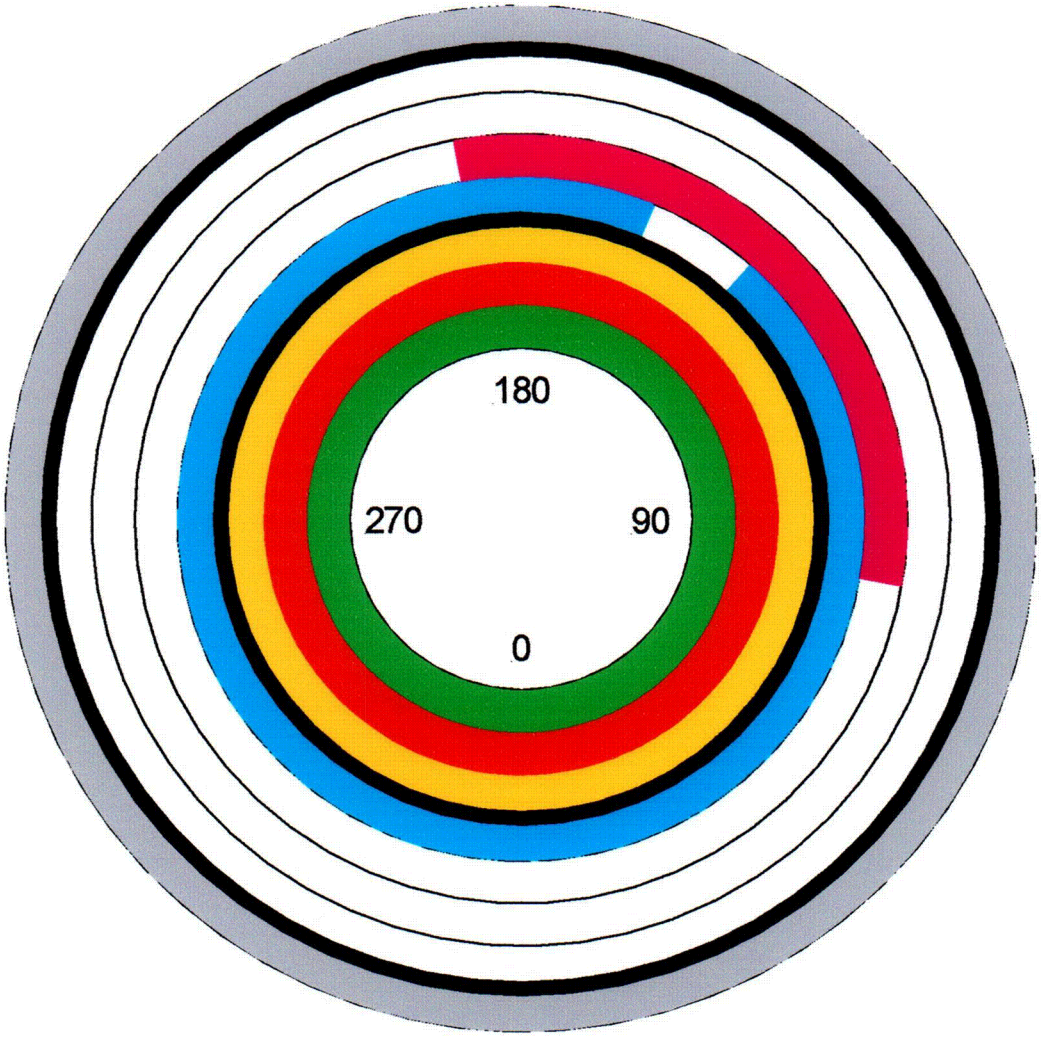
Sketch of ICI Eddy Current Examinations



C02

ICI Nozzle Inspection Coverage

Nozzle 92

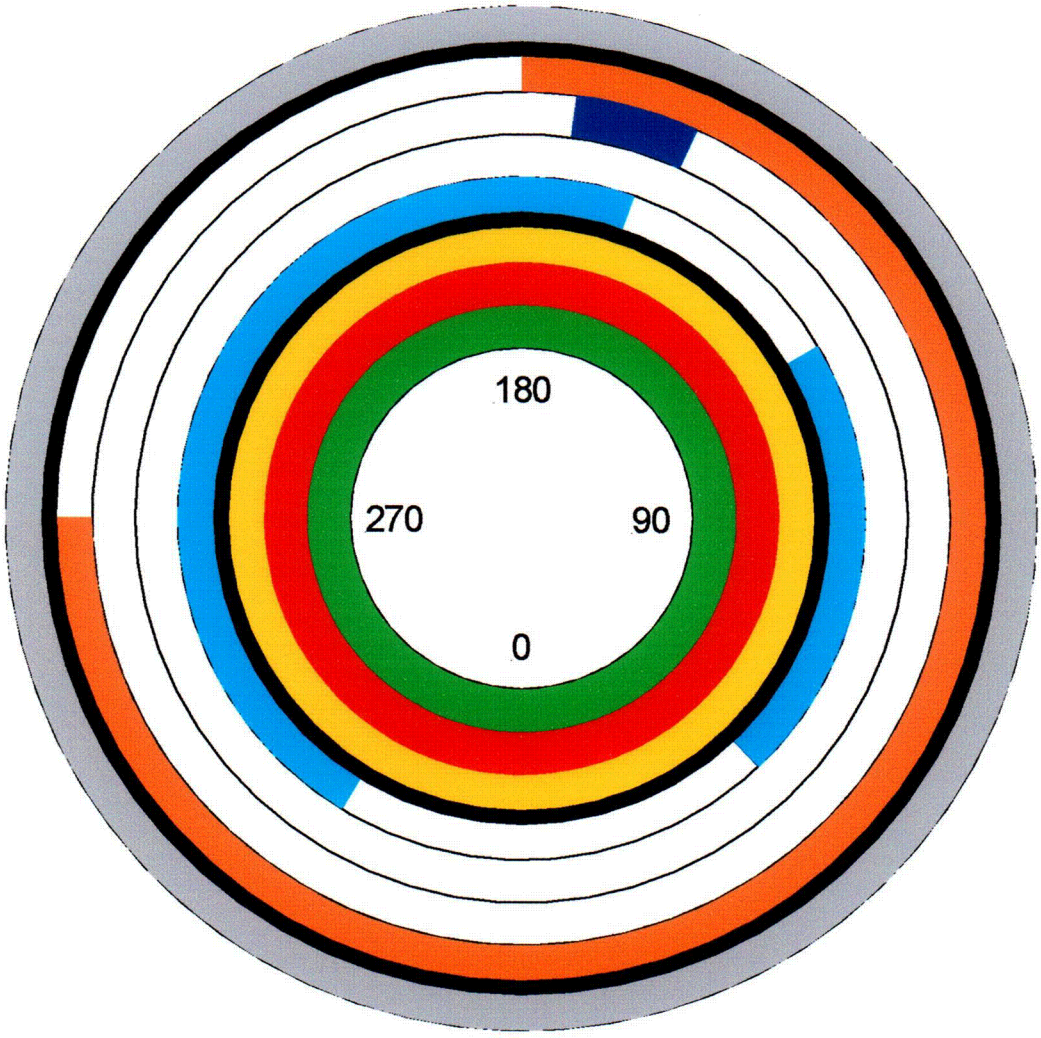


- ID Surface ET 1
- Bottom Face ET 2
- OD Surface Below Weld ET 3 & 4
- UT Coverage to Bottom of Weld UT 1
- Supplementary UT to Bottom of Weld UT 2
- J-Groove ECT ET 5
- PT
- UT Leak Path Assessment

C03

ICI Nozzle Inspection Coverage

Nozzle 93

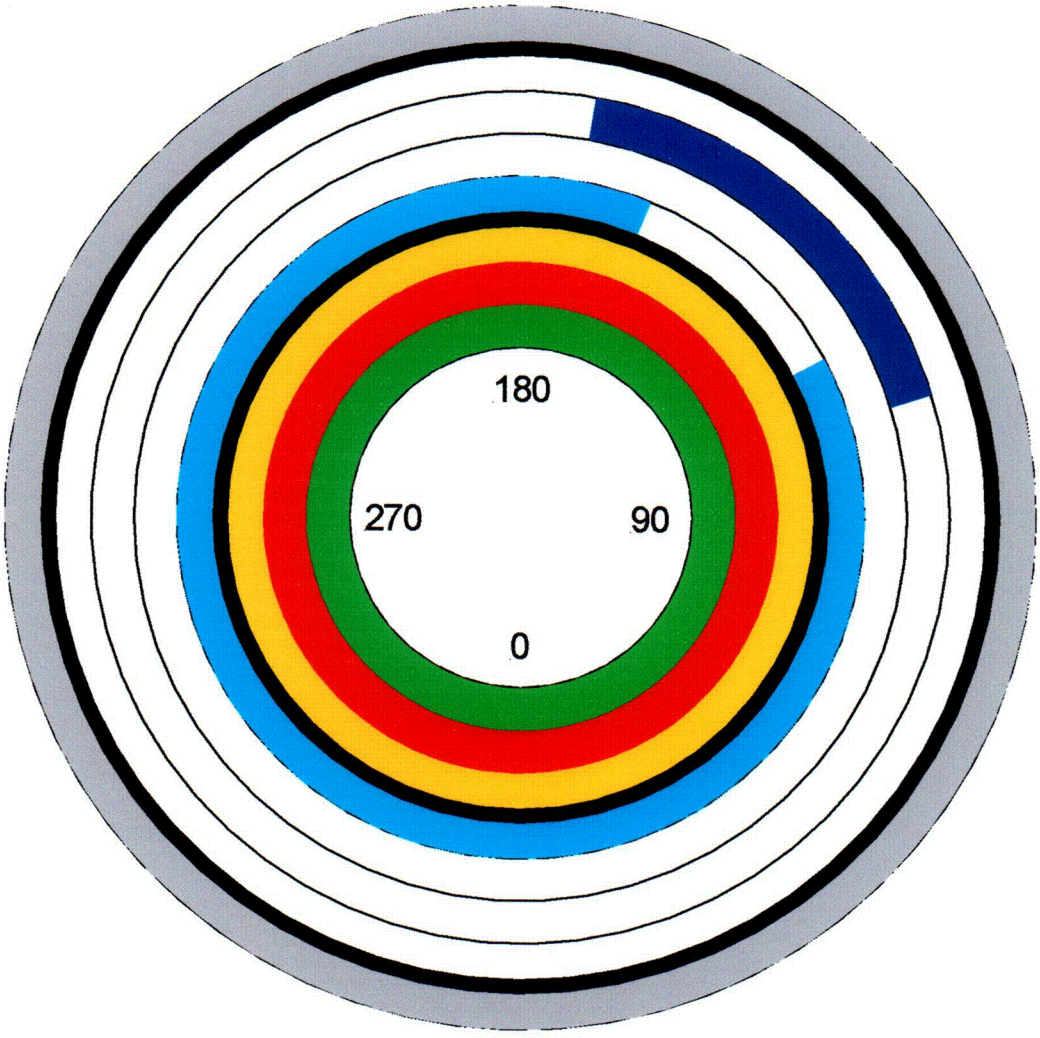


- ID Surface ET 1
- Bottom Face ET 2
- OD Surface Below Weld ET 3 & 4
- UT Coverage to Bottom of Weld UT 1
- Supplementary UT to Bottom of Weld UT 2
- J-Groove ECT ET 5
- PT
- UT Leak Path Assessment

C04

ICI Nozzle Inspection Coverage

Nozzle 94

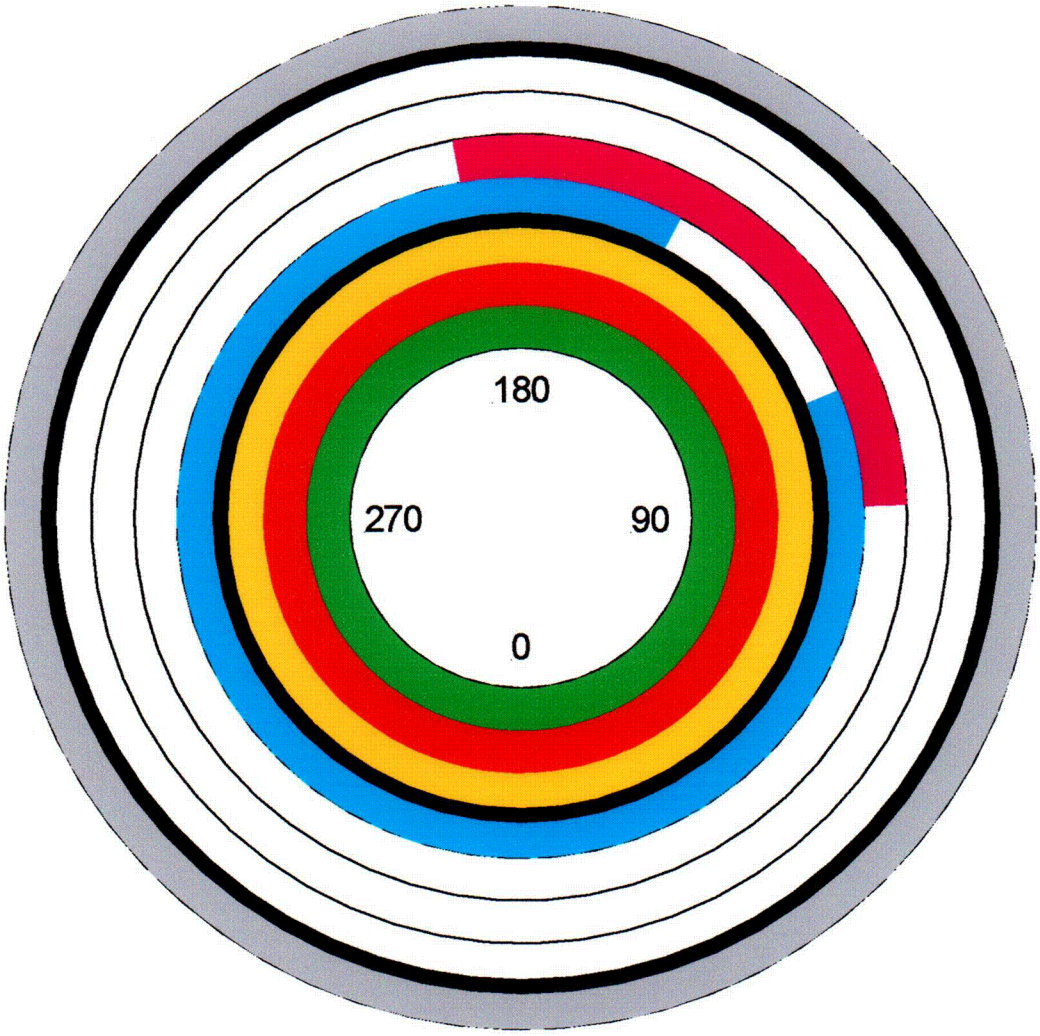


- ID Surface ET 1
- Bottom Face ET 2
- OD Surface Below Weld ET 3 & 4
- UT Coverage to Bottom of Weld UT 1
- Supplementary UT to Bottom of Weld UT 2
- J-Groove ECT ET 5
- PT
- UT Leak Path Assessment

C05

ICI Nozzle Inspection Coverage

Nozzle 95

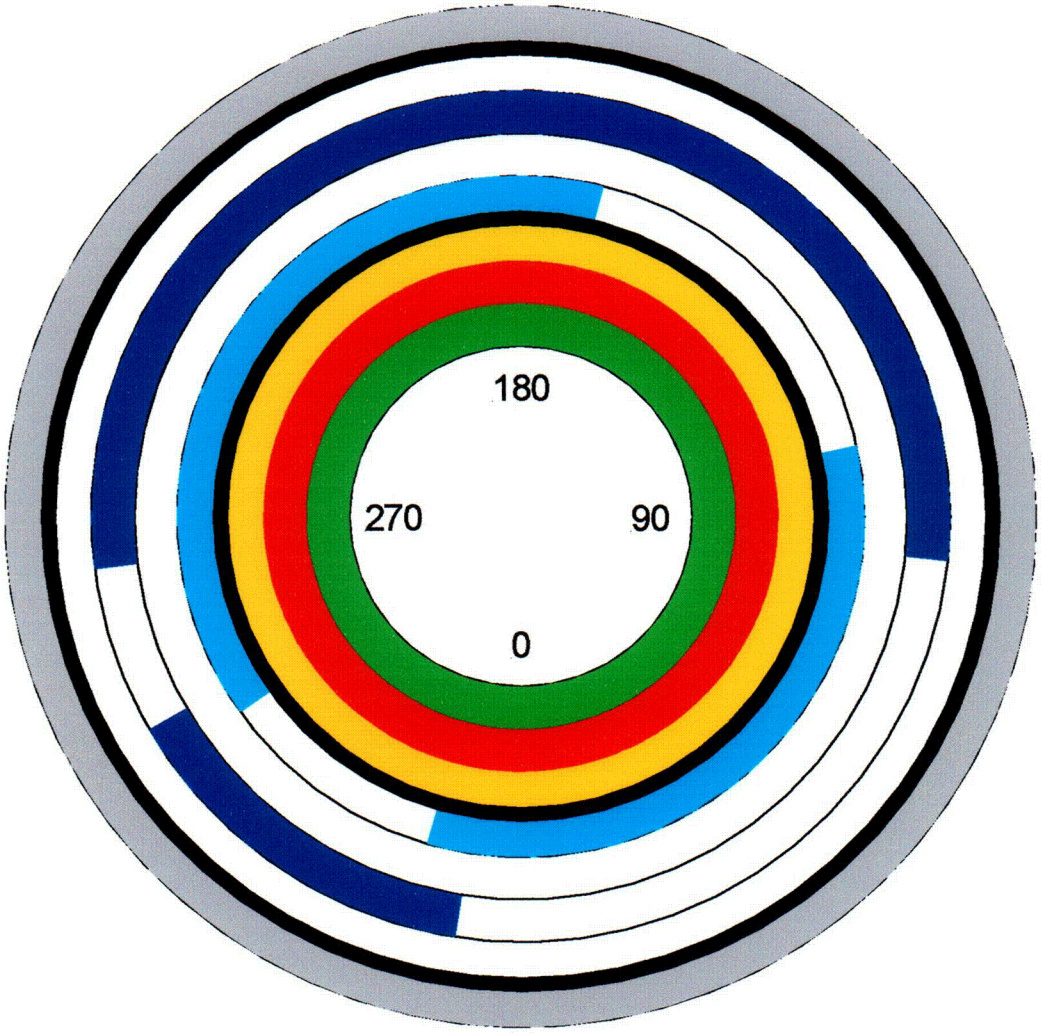


- ID Surface ET 1
- Bottom Face ET 2
- OD Surface Below Weld ET 3 & 4
- UT Coverage to Bottom of Weld UT 1
- Supplementary UT to Bottom of Weld UT 2
- J-Groove ECT ET 5
- PT
- UT Leak Path Assessment

C06

ICI Nozzle Inspection Coverage

Nozzle 96

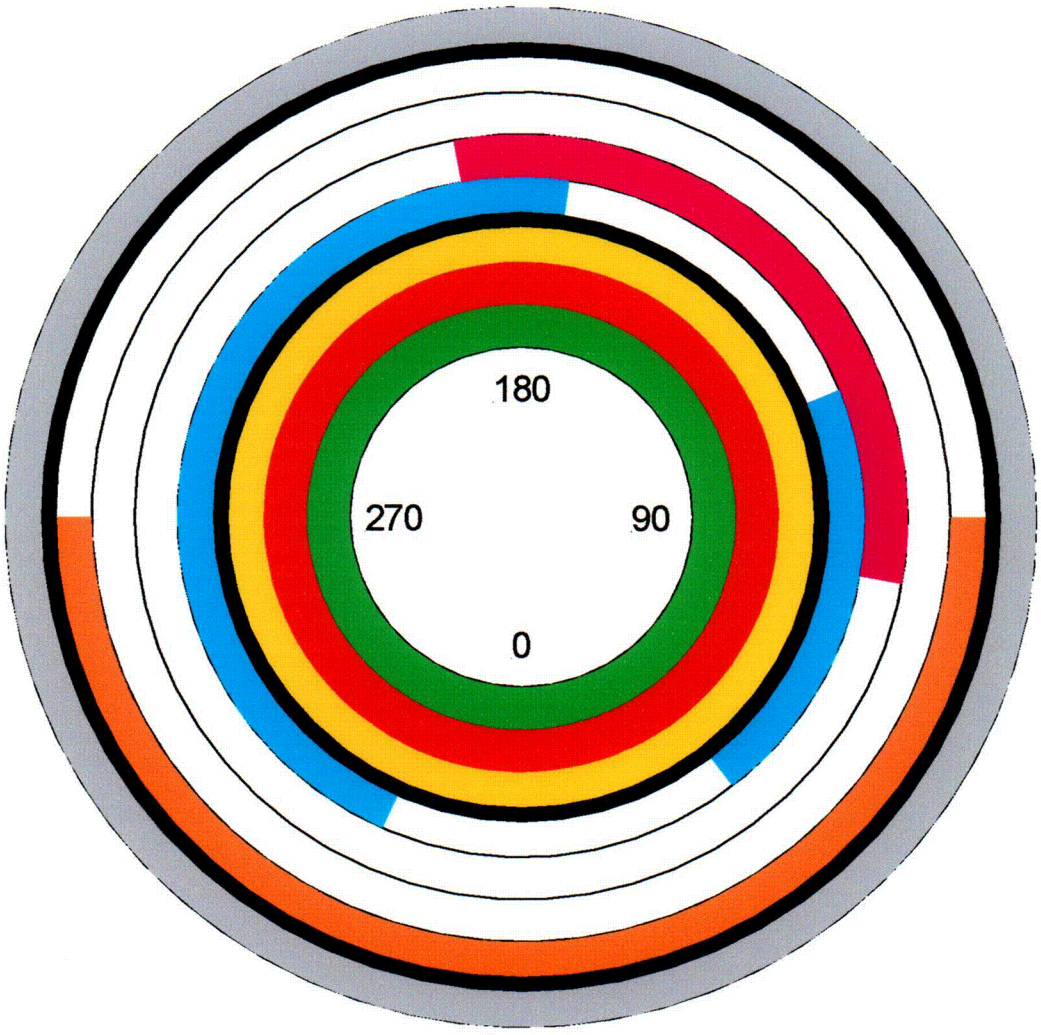


- ID Surface ET 1
- Bottom Face ET 2
- OD Surface Below Weld ET 3 & 4
- UT Coverage to Bottom of Weld UT 1
- Supplementary UT to Bottom of Weld UT 2
- J-Groove ECT ET 5
- PT
- UT Leak Path Assessment

C07

ICI Nozzle Inspection Coverage

Nozzle 97

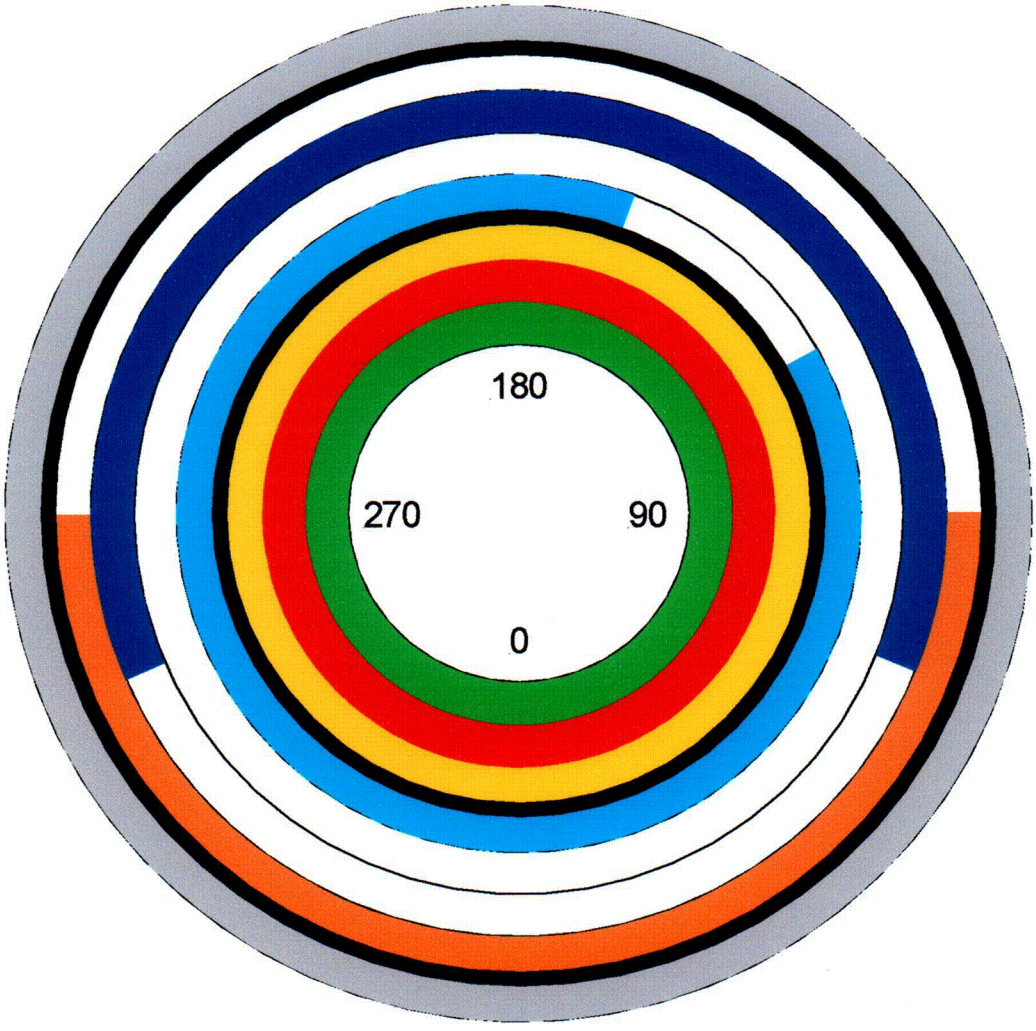


- ID Surface ET 1
- Bottom Face ET 2
- OD Surface Below Weld ET 3 & 4
- UT Coverage to Bottom of Weld UT 1
- Supplementary UT to Bottom of Weld UT 2
- J-Groove ECT ET 5
- PT
- UT Leak Path Assessment

C08

ICI Nozzle Inspection Coverage

Nozzle 98

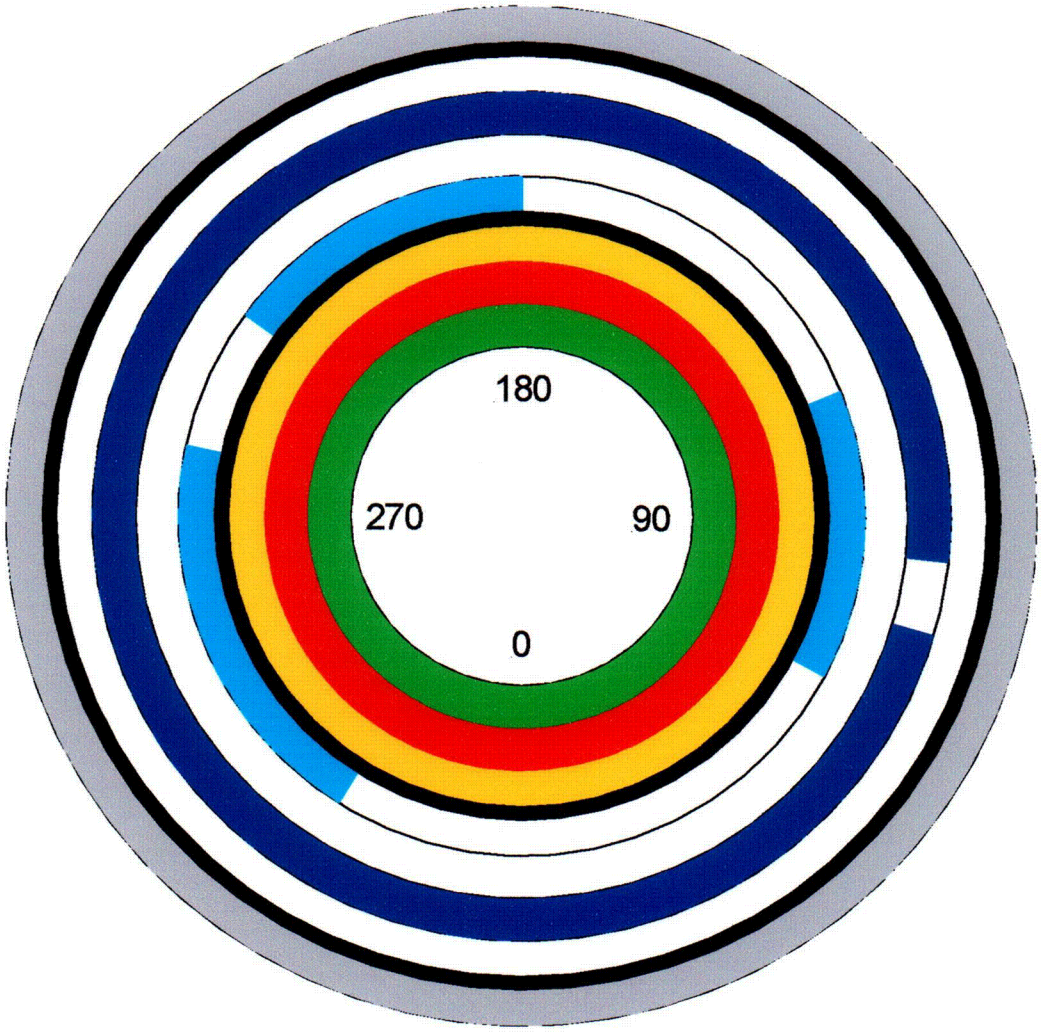


- ID Surface ET 1
- Bottom Face ET 2
- OD Surface Below Weld ET 3 & 4
- UT Coverage to Bottom of Weld UT 1
- Supplementary UT to Bottom of Weld UT 2
- J-Groove ECT ET 5
- PT
- UT Leak Path Assessment

C09

ICI Nozzle Inspection Coverage

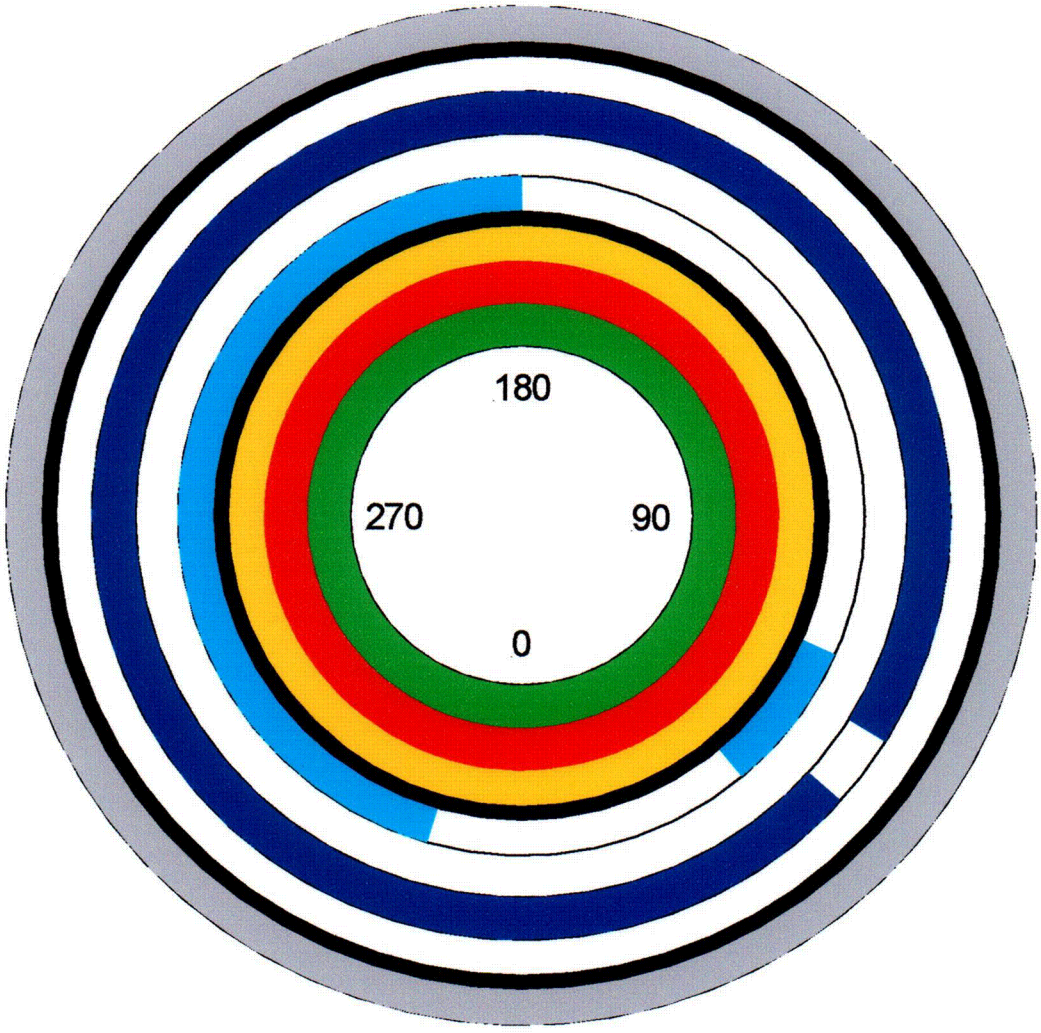
Nozzle 99



- ID Surface ET 1
- Bottom Face ET 2
- OD Surface Below Weld ET 3 & 4
- UT Coverage to Bottom of Weld UT 1
- Supplementary UT to Bottom of Weld UT 2
- J-Groove ECT ET 5
- PT
- UT Leak Path Assessment

ICI Nozzle Inspection Coverage

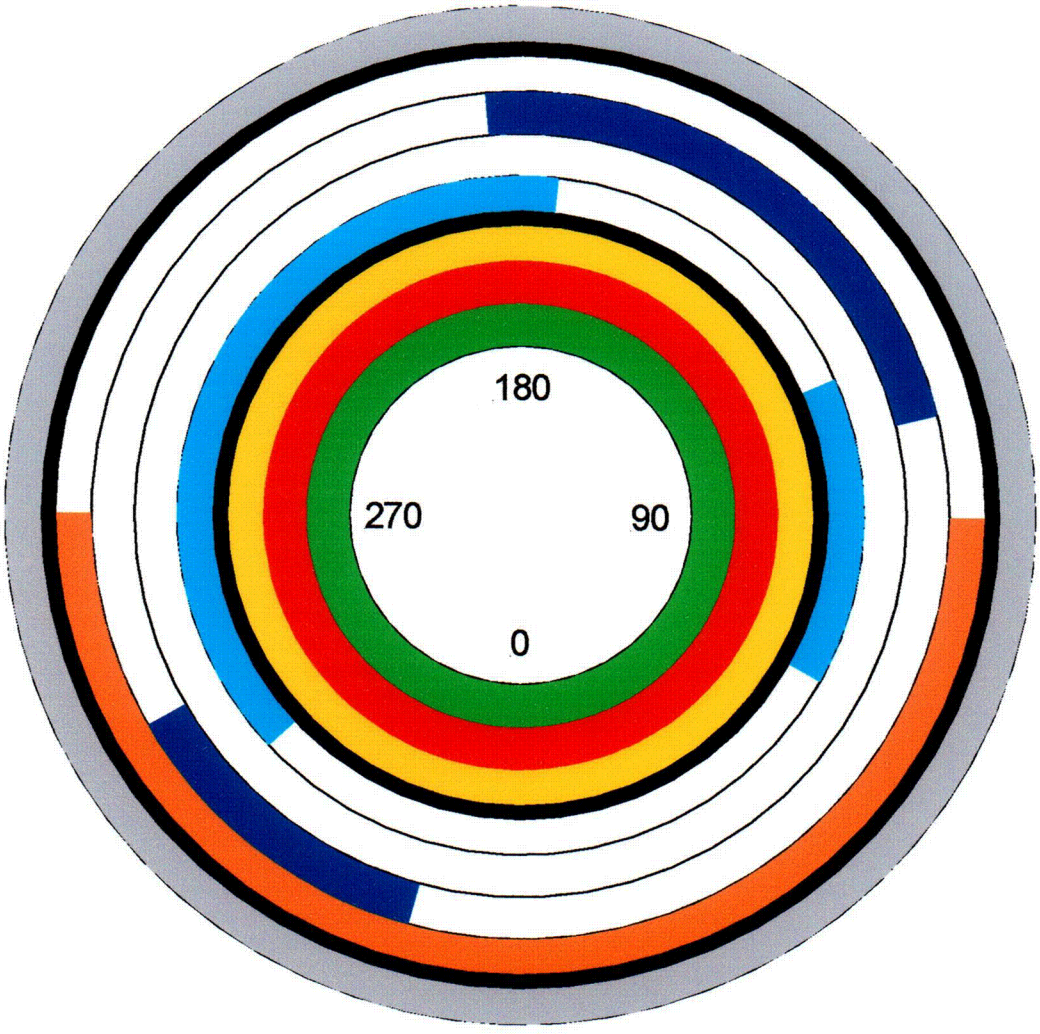
Nozzle 100



- ID Surface ET 1
- Bottom Face ET 2
- OD Surface Below Weld ET 3 & 4
- UT Coverage to Bottom of Weld UT 1
- Supplementary UT to Bottom of Weld UT 2
- J-Groove ECT ET 5
- PT
- UT Leak Path Assessment

ICI Nozzle Inspection Coverage

Nozzle 101



- ID Surface ET 1
- Bottom Face ET 2
- OD Surface Below Weld ET 3 & 4
- UT Coverage to Bottom of Weld UT 1
- Supplementary UT to Bottom of Weld UT 2
- J-Groove ECT ET 5
- PT
- UT Leak Path Assessment

C12